

**To:** Kent, Bruce[Kent.Bruce@epa.gov]  
**From:** Kusnierz, Lisa  
**Sent:** Tue 10/13/2015 7:42:46 PM  
**Subject:** FW: Rosebud Mine data  
Rosebud Outliertest 101315.xlsx

I'm not sure if we have any sort of standard guidance about dealing with outliers. I spoke with DEQ this morning about Rosebud and she is going to use your RP tool. However, she mentioned the single sampling event with high values that you mentioned and ask about discarding as outliers.

She said that the weird formula in the permit writer's manual was developed by Tetra Tech.

Lisa

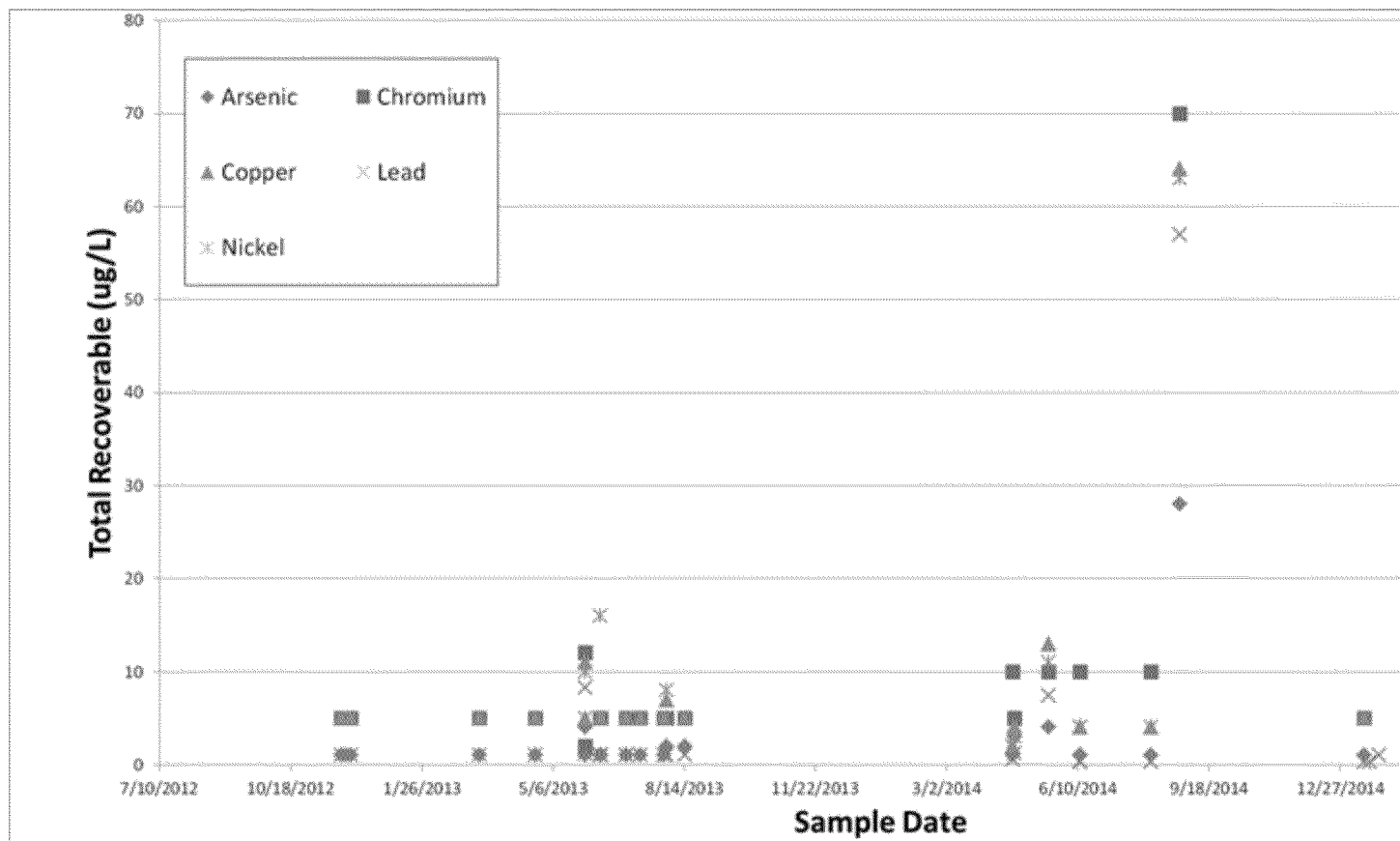
**From:** Sjolund, Melissa [mailto:MSjolund@mt.gov]  
**Sent:** Tuesday, October 13, 2015 1:40 PM  
**To:** Kusnierz, Lisa <kusnierz.lisa@epa.gov>  
**Subject:** Rosebud Mine data

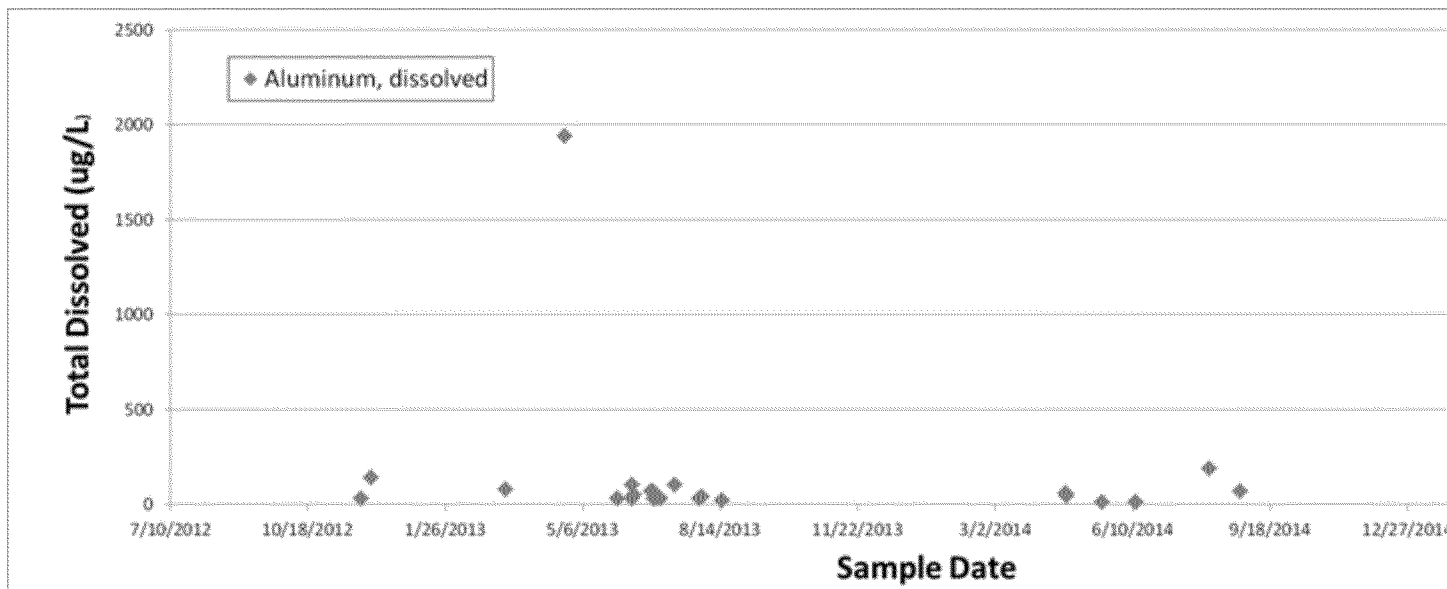
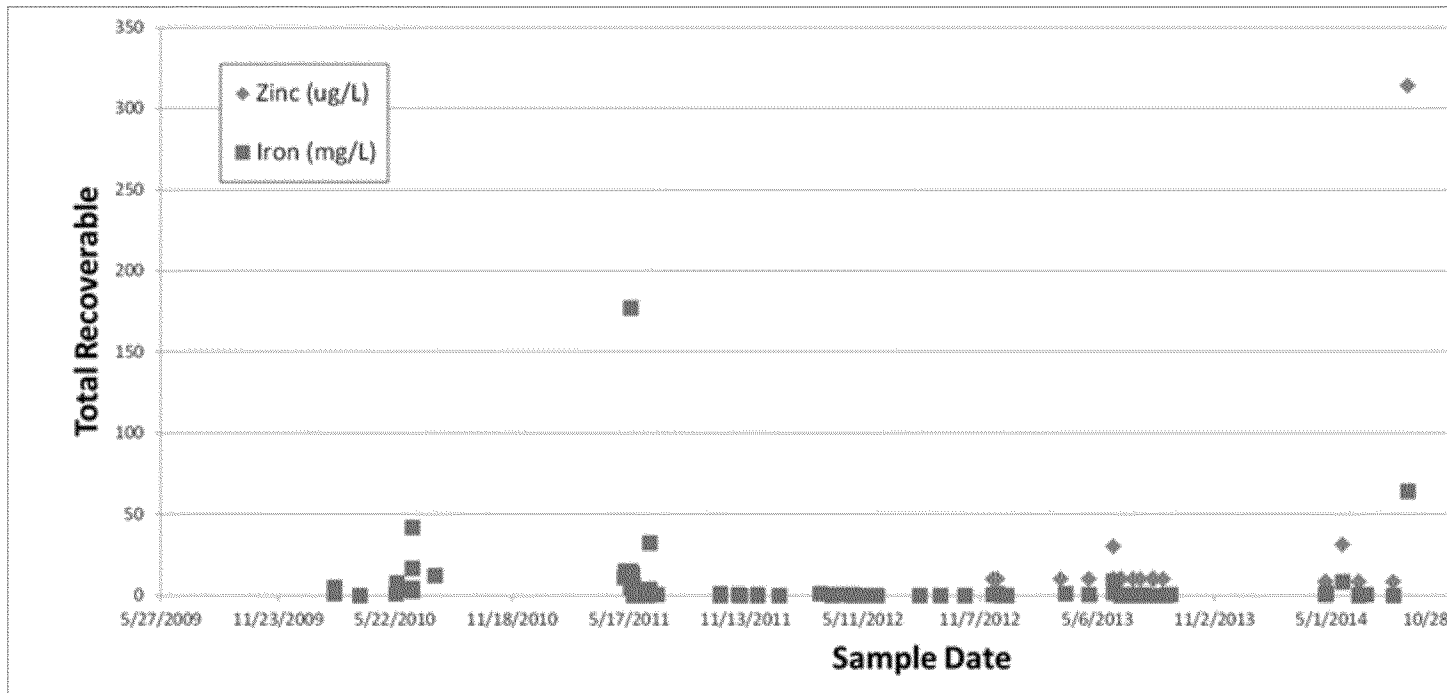
Hi Lisa,

As we discussed earlier today, below are a few charts of effluent metals concentrations at the Rosebud Mine that I believe show that the sample collected 8/27/2014 is an outlier. I spoke with the operator about this sample: it was collected using automated bottle samplers; the discharge was the result of 2.5-inches of precipitation in 24 hours (this exceeds the 10-yr/24-hr event). The precipitation event was from 8/23-8/24, and the station was visited on 8/25. For some reason, the operator did not see signs of discharge and did not check the bottles, assuming they were empty. Two days later (8/27) it was discovered during a DEQ inspection that the bottles were indeed full, and the samples were sent to the lab. I haven't checked yet to see if any holding times were exceeded.

Please share with Bruce and let me know what you think. I was able to add to the data set a little bit by getting DMR data from the last year that weren't originally included in the analysis. Data

are attached.





I also performed a Tukey Outlier Boxplot Test, which has no distribution assumptions since the data sets are pretty skewed with so many non-detects.

- The Tukey test indicated that the 8/27/2014 sample is an outlier for the parameters

shown on the charts above (Al, As, Cr, Cu, Pb, Ni, Fe, and Zn) . It is interesting to note that the most extreme outliers for dissolved aluminum and total iron came from samples collected on 5/31/2013 and 5/20/2011, respectively.

- No outliers were identified for the following: Cd, Hg, Se, Ag, and nitrite + nitrate.

If you or Bruce can suggest any other good outlier tests to use, let me know. Based on the test results and chart observations, I believe there is a strong case for removing the 8/27/2014 sample from the data set.

Thank you for your time and advice. Let me know if there is any other information I can provide.

**Melissa Sjolund**

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